

Mesh Generation and Adaption for High Reynolds Number RANS Computations, Phase I

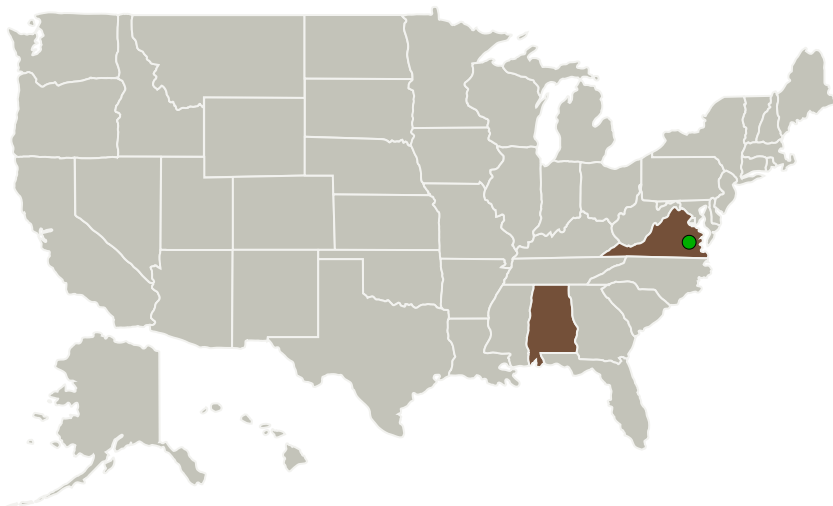
Completed Technology Project (2010 - 2011)



Project Introduction

This proposal offers to provide NASA with an automatic mesh generator for the simulation of aerodynamic flows using Reynolds-Averages Navier-Stokes (RANS) models. The tools will be capable of generating high-quality, highly-stretched (anisotropic) grids in boundary layer regions and transition smoothly to inviscid flow regions even in an adaptive context. The objective of the work is to offer a unified view for generating quality and robust RANS meshes coupled naturally with anisotropic mesh adaptation. Our innovation is to view the anisotropic mesh generation within the Riemannian metric framework which thus far has been used exclusively in anisotropic mesh adaptation. Using the metric-based framework allows much easier handling of the large mesh size ratios involved in the computation, whereas traditional methods use the Euclidean framework to compute distance and volume. This innovative view to generate these meshes makes the entire procedure more generic and much more robust. The emphasis is being put on deriving a completely automatic process to generate quality and robust anisotropic meshes. Our existing and proven software package will be modified to include these innovative methods. A NASA test case will be computed for validation of the methods. The software will be delivered in Phase II.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Research South, Inc.	Lead Organization	Industry	Huntsville, Alabama
George Mason University	Supporting Organization	Academia	Fairfax, Virginia
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Alabama	Virginia
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Project Transitions

**January 2010:** Project Start**January 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140151>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Research South, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

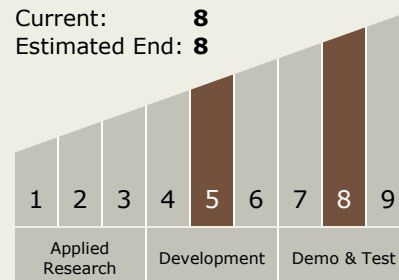
Carlos Torrez

Principal Investigator:

Lawrence W Spradley

Technology Maturity (TRL)

Start: 5
Current: 8
Estimated End: 8



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Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
 - └ TX11.3 Simulation
 - └ TX11.3.6 Uncertainty Quantification and Nondeterministic Simulation Methods

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System